Psychometric properties of three measures of "Facebook engagement and/or addiction" among a sample of English speaking Pakistani university students

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Abstract

For researchers interested in measuring the construct of “Facebook engagement and/or addiction” there are a number of existing measures including the Bergen Facebook Addiction Scale, the Facebook Intensity Scale, and the Addictive Tendencies Scale. Currently, there is limited data on the psychometric properties of these three scales, especially among South Asian samples. The present aim was to address this shortfall. A sample of 308 English speaking Pakistani university students completed the scales, in their original English versions, on two occasions separated by four weeks. Results demonstrated that for each of the scales, across both administrations, satisfactory psychometric properties were found, including internal reliability, temporal stability, and construct validity. Moreover, for these three scales, using confirmatory factor analysis, a one-factor structure was generally found to be a good description of the data for both male and female~~s~~ samples. These data provide further evidence for the reliability and validity of three scales concerned with “Facebook engagement and/or addiction”.

Keywords: Facebook, addiction, Pakistan, validity, reliability

Introduction

Over the last decade, computer-mediated communication has increased via a range of social networking sites (SNSs) such as MySpace and Facebook. They provide a virtual platform where users can create individual public profiles, establish or maintain social connections, and join virtual groups based on common interests (Ellison, Steinfield, & Lampe, 2007). Launched in 2004, Facebook is one of the most popular SNSs connecting over a billion people worldwide in 2012 (Facebook, 2013). More recently, Facebook has announced that its global community is continuing to grow, especially in countries such as India, Indonesia, and Brazil (Facebook, 2018a), with daily active users (DAUs) and monthly active users (MAUs) both showing an increase of 13% in the first quarter of 2018 compared to 2017 (DAUs = 1.45 billion; MAUs = 2.20 billion) (Facebook, 2018b). With a growth in the use of the internet comes the potential for concern as people engage in a variety of online activities that have the potential to become addictive (Cash, Rae, Steel, & Winkler, 2012; Doan, 2012; Weinstein & Lejoueux, 2010). Young (2000) maintains that there are five subcategories of internet addiction; cybersexual addiction, net compulsions, information overload, computer overload, and cyber-relationship addiction. It is the latter of these addictions that can be related to SNSs, or more specifically “Facebook engagement and/or addiction”; since the main focus of Facebook appears to be the creation and maintenance of social capital (Ellison et al., 2007).

Research examining the construct of “Facebook engagement and/or addiction” is still a relatively new area of research and the self-report measures developed to measure the construct have only been published comparatively recently. A recent review article of social network site (SNS) addiction (Andreassen & Pallesen, 2014) reports seven self-report scales that have been developed to assess SNS (predominately Facebook) addiction that have been published in the peer-reviewed literature: Addiction Tendencies Scale (Wilson et al., 2010), Facebook Intrusion Questionnaire (Elphinston & Noller, 2011), Bergen Facebook Addiction Scale (Andreassen et

al., 2012), Social Networking Website Addiction Scale (Turel & Serenko, 2012), Facebook Dependence Questionnaire (Wolniczak et al., 2013), Facebook Addiction Scale (Koc & Gulyagci, 2013), and Addictive Tendencies Towards SNSs (Wu, Cheung, Ku, & Hung, 2013). In addition, there are four self-report scales that address related constructs to that of measuring the addictive use of SNSs: the Addictive Tendencies Scale (ATS; Ellison et al., 2007), which measures how emotionally connected individuals are to Facebook; the Facebook Intensity Scale (FIS; Pelling & White, 2009), which measures the levels of usage of social networking sites in general (e.g., Facebook, Bebo) along with any addictive tendencies towards their use; the Online Sociability Test (Ross et al., 2009), which measures frequencies of different uses of Facebook such as sending private messages and commenting on others photographs; and the Motives for Facebook Usage Scale (Koc & Gulyagci, 2013), which measures the uses of Facebook (e.g., social, academic, informational).

Such self-report scales of “Facebook engagement and/or addiction” have only been developed comparatively recently and therefore there presently exists only limited psychometric data on them. Moreover, most previous research has been undertaken in North America and Europe and there exists little data on Facebook engagement and/or addiction in developing countries despite the Asia-Pacific regions having the largest growth in DAUs and MAUs each quarter since 2016 (Facebook, 2018c). In light of this, the present study, utilizing a convenience sample of participants, sought to provide further data on the psychometric properties of three scales measuring “Facebook engagement and/or addiction”, the ATS (Ellison et al., 2007); the FIS (Pelling & White, 2009); and the Bergen Facebook Addiction Scale (BFAS; Andreassen, Tosheim, Brunborg, & Pallesen, 2012) among a non-clinical sample of English speaking Pakistani university students. No attempt was made to review cultural or clinical factors within this study. The selection of these three scales was based on their known

availability when the study was being developed and perceived limitations of research undertaken using them.

In light of previous research that has used the ATS, the FIS, and the BFAS, the present study had three aims. The first aim was to test the unidimensionality of each of the three scales using confirmatory factor analysis. It has been assumed by the developers and users of each of the scales, that each unidimensional and therefore it was predicted that each of the measures would be unidimensional. Further, the intention was to extend the validation evidence (external validity) by testing the unidimensional factor structure for gender invariance. The second aim was to examine the temporal stability of each of these three scales by reporting the Pearson's Product Moment Correlations between scores on each scale at Time 1 and then again at Time 2. Based on the findings of Andreassen et al. (2012), it was predicted that each of these three scales would be temporally stable, as indicated by strong positive correlations between scores at Time and Time 2. The third aim was to examine the construct validity of these three scales by reporting the inter-correlations between them using Pearson's Product Moment Correlations. As each scale is concerned with "Facebook engagement and/or addiction" it was therefore predicted that each of these three scales would be significantly positively associated with each other and each would be positively associated with the two activity measures embedded within the FIS (i.e., "number of friends" and "time spent").

Therefore, it was hypothesized that in line with the assumptions of the developers of the measures, each of the three measures of Facebook Addiction would be unidimensional, temporally stable, and be significantly positively associated with each other.

Method

Sample

Three-hundred and eight undergraduate students (168 male and 140 female) were recruited through a convenience sampling strategy all in attendance either at Bahauddin Zakariya University, Multan or University of the Punjab, Lahore, Pakistan and enrolled on social science courses. Their mean age was 21.90 years (SD = 2.07),. All respondents were proficient in English as it is one of Pakistan's official languages. English is taught to all school-level Pakistani students. At college and university level, all instructions are in English. Therefore, it is a common practice to use English version (measures) in regional research projects employing college or university student sample in Pakistan. No credit was given for participation.

Measures

All students completed a questionnaire booklet containing three scales measuring:

i). The Bergen Facebook Addiction Scale (BFAS; Andreassen, Tosheim, Brunborg, & Pallesen, 2012) was designed to measure the possibility of an obsession with a specific area of the Internet, the social networking site known as "Facebook". The measure is a 6-item self-report scale, containing one item for each of the six core features of addiction: salience, mood, modification, tolerance, withdrawal, conflict, and relapse (Griffiths, 2005). The six items are contained in Table 3. Each of the six items is scored on a 5-point Likert scale ranging from "very rarely" (1), through "sometimes" (3), to "very often" (5). The higher the score the greater the "Facebook addiction". Scores can range between 6 and 30. The scale has been found to have acceptable psychometric properties in terms of internal consistency (Cronbach's alpha coefficient = .83), factor structure (unidimensional), and temporal stability (test-retest correlation .82 over 3 weeks; Andreassen et al., 2012). In a further study that looked at the relationship between behavioural addictions and personality in 218 Norwegian university students, the Cronbach's alpha coefficient was found to be .86 (Andreassen et al., 2013). However, it has been argued as there are a variety of activities that an individual can engage in,

156 such as communicating with others, playing games, gambling, watching videos or updating
157 profiles, the term Facebook addiction may already be obsolete (Griffiths, 2012).

158 ii) The Facebook Intensity Scale (FIS; Pelling & White, 2009) was designed to measure how
159 emotionally connected individuals were to the social networking site "Facebook", how they
160 incorporated it into their day to day lives, as well as measuring usage frequency and duration.
161 The measure contains six attitudinal items designed to measure the degree to which participants
162 are emotionally attached to Facebook and the extent to which it is embedded into daily life.
163 The measure also asks participants how many Facebook friends they have ("Approximately
164 how many total Facebook friends do you have?" ["number of friends"]) and their level of active
165 engagement on Facebook on a typical day "In the past week, on average, approximately how
166 much time per day have you spent using Facebook?" ["time spent"]). Each of the six attitudinal
167 items is scored on a 5-point Likert scale ranging from "strongly disagree" (1), through "neither
168 agree nor disagree" (3), to "strongly agree" (5). The higher the score the greater the emotional
169 attachment to Facebook. Scores can range between 6 and 30. Participants rate the level to which
170 they agreed or disagreed with a series of statements (see Table 4). The scale has been found to
171 have a satisfactory level of internal consistency among various samples. For example, .83
172 (Ellison et al., 2007), .84 and .88 (Steinfield, Ellison, & Lampe, 2008), .89 (Valenzuela, Park,
173 & Kee, 2009), and .80 (Burke, Marlow, & Lento, 2010).

174 iii) The Addictive Tendencies Scale (ATS; Ellison et al., 2007) was designed to measure the
175 levels of usage of social networking sites in general (e.g., Facebook, Bebo) along with any
176 addictive tendencies towards their use. The measure is an 8-item self-report scale, based on
177 previous research by Ehrenberg, Juckes, White, and Walsh (2008), and is designed to measure
178 addictive tendencies towards SNSs. The items are contained in Table 5. Each item is scored on
179 a 7-point Likert scale ranging from "strongly disagree" (1), though "neither agree nor disagree"
180 (4), to "strongly agree" (7). Scores can range between 8 and 56. The scale has been found to

have acceptable psychometric properties in terms of internal consistency (Cronbach's alpha coefficient = .85). No further studies examining the reliability of the scale were identified (K. White (personal communication, July 19, 2013)).

Demographic information (age and gender) was collected as were identifiers to facilitate the collation of respondents' questionnaire booklet at Time 1 and Time 2. All measures were administered in English.

Procedure

The survey booklet was completed during class time and again four weeks later. Participants recorded their names and age but were assured of confidentiality, and participation was voluntary. None of the class declined to participate, and no credit was given for completing the questionnaires on either occasion. Participants were not informed that the measure would be re-administered.

Missing Data

Missing data ranged from a low of .09% for ATS to a high of 3% for BFAF. The missing data were handled under the assumption of missing at random (MAR) using a full information maximum likelihood (FIML) method. Studies demonstrate that FIML is a preferred method to deal with missing data (Schlomer, Bauman, & Card, 2010). Further, it has been shown to produce unbiased and more accurate parameter estimates across a variety of conditions, particularly under MAR, missing completely at random and at small sample sizes (Enders & Bandalos, 2001).

Statistical Analyses

Using SPSS v24, each variable ("number of friends", "time spent") and the three scales were analysed using descriptive statistics (mean, confidence interval, and standard deviation). The

temporal stability of the three scales was assessed by calculating paired samples *t*-test to compare the mean scores of each of the scales at Time 1 and Time 2 (> .7 for test-retest are considered satisfactory; Kline, 2015). The reliability estimates of the three scales were assessed using Cronbach’s alpha and Intraclass correlation coefficients (> .7 for test-retest are considered satisfactory; Kline, 2015). The association between the two Facebook activity questions (“number of friends” and “time spent”) and the three scales was assessed using Pearson’s Product-Moment Correlation. The convergent validity of the three scales was assessed using Pearson’s Product-Moment Correlation. Effects sizes for correlations range from small r = .10, through medium r = .30, to large r =.50 (Cohen, 1992).

Confirmatory factor analysis (CFA) was conducted employing AMOS Version 22 to test the specific hypotheses regarding the dimensional structure of the three scales. To evaluate the overall fit of the CFA models under examination, the following indices were calculated; the Sattora-Bentler scaled chi-square (Hoyle & Panter, 1995), the Root Mean Square Error of Approximation with 90 percent confidence intervals (RMSEA; Steiger, 1990), the Comparative Fit Index (CFI; Bentler, 1990), and the Standardized Root Mean Square Residual (SRMR; Hu & Bentler, 1999). A non-significant chi-square is considered to reflect acceptable fit (Jöreskog & Sörbom, 1993). However, as sample size increases the chi-square value is more likely to become significant (Tanaka, 1987). For the RMSEA, A value less than .06 indicates good fit while a value above .08 represents poor errors of approximation in the population (Byrne, 1998). For the CFI value, at or above .95 is considered acceptable (Raykov & Marcoulides, 2000). For the SRMR value, less than .08 is considered to be indicative of acceptable model fit (Hu & Bentler, 1998).

Results

Descriptive Statistics

All of the respondents had Facebook accounts and all reported having Facebook friends with the minimum number of friends being two, and the maximum being 4500 (mean 231.88, SD = 377.75). The daily amount of time spent on Facebook ranged from a minimum of five minutes to a maximum of 500 minutes (mean 87.56, SD = 78.22).

Descriptive statistics

Table 1 contains the means, standard deviations, and Cronbach’s alpha coefficients of the three scales at both Time 1 and Time 2 testing periods. In addition, the Pearson’s Product-Moment Correlation coefficient, intra-class correlation, and the paired samples *t*-tests are also included. Satisfactory levels of internal reliability were found for the three scales at both Time 1 and Time 2 (> .7; Kline, 2015).

Temporal Stability

For each of the three scales, scores at Time 1 were significantly associated with scores at Time 2 and exceeded the criteria of .7 as suggested by Kline (2000). Moreover, a repeated measures *t*-test indicated that there were no significant differences in the mean scores between Time 1 and Time 2 for each of the three measures.

<INSERT TABLE 1 HERE>

Convergent Validity

Table 2 contains the Pearson Product Moment Correlations between each of the three scales, as well as with the measures of Facebook “friends”, and “time spent” on Facebook. At both Time 1 and Time 2, it was found that all three scales were significantly associated with each other.

At both Time 1 and Time 2, each of the three scales was associated with scores on the Facebook “friends” and “time spent” on Facebook.

<INSERT TABLE 2 HERE>

Confirmatory Factor Analysis for the Bergen Facebook Addiction Scale

Following Andreassen et al. (2012), a confirmatory factor analysis (CFA) was conducted on items 1, 5, 7, 11, 13, and 16 of the BFAS (i.e., those items that were retained in the final scale due to having the highest corrected item-total correlation within each of the six addiction elements) with one-factor specified, using AMOS 22. Results presented in Table 6 showed a non-significant chi-square ($\chi^2 = 13.65$, df = 9, p = .14). Other fit indices including CFI = .99, TLI = .98, IFI = .99, and a non-significant RMSEA = .04 (p = .59) suggested an excellent fit of the CFA model to the data (Hu & Bentler, 1999). Item loading ranging ($\lambda = .50$) to ($\lambda = .73$) showed that all items are valid indicators of the underlying latent construct “Facebook engagement and/or addiction”. The CFA model was further extended to test gender invariance. For the purpose, the default model was first tested across gender with open estimates to test configural invariance. A non-significant change in chi-square along with an excellent fit of the model to the data supported configural invariance across gender. In the second step, metric level invariance was tested and the model was reassessed by applying equality constraints for male and female on factor loadings of all six items to the latent factor. A non-significant delta chi-square ($\Delta\chi^2 = 7.53$, df = 9, p = .58) along with ΔCFI < .01, and ΔRMSEA <.01 showed that CFA model with equality constraint across gender and is equally generalizable to both males and females. In the last step, intercepts were constrained to be equal across gender to test scalar level invariance. The result ($\Delta\chi^2 = 8.31$, df = 12, p = .78) further supported scalar level invariance of BFAS. The negative values of delta CFI and a decrease in RMSEA rather showed an improved model with metric and scalar level invariance.

<INSERT TABLE 3 HERE>

<INSERT TABLE 4 HERE>

Confirmatory Factor Analysis for the Facebook Intensity Scale

A one-factor CFA was conducted on the FIS. Results showed that the Satorra-Bentler scaled chi-square was significant (χ^2 = 77.88, *df* = 9, $p < .01$). Other fit indices including CFI = .86, TLI = .68, IFI = .86, and a significant RMSEA = .16, p < .01 suggesting a reasonable error of approximation in the population (Byrne, 1998) failed to establish good fit of the model to the data (Hu & Bentler, 1999). A review of modification index suggested that residual of item six co-vary with the residual of item-2, item-4, and item-5. Addition of the three residual covariances resulted in a significant improvement of the model ($\Delta\chi^2$ = 60.32, df = 3, $p < .01$). The fit indices of the revised model M1 (χ^2(df) = 17.16 (6) p = .01, CFI = .98, TLI = .92, IFI = .98, and non-significant RMSEA = .08, p = .11) supported a good fit of the model to the data. Factor loadings ranged from .45 to .82 and are shown in Table 4. These results suggest that a one-factor structure was a good description of the data. The three-step analysis for testing gender invariance further supported generalizability of the measure at configural, metric ($\Delta\chi^2$ = 4.77, df = 6, $p < .57$) and scalar ($\Delta\chi^2$ = 7.61, df = 12, $p < .83$). Negative ΔCFI (i.e., -.003, and -.009) and a decrease in RMSEA (i.e., .016, and .029) showed even improved models respectively for metric level and scalar level invariance.

<INSERT TABLE 5 HERE>

Confirmatory Factor Analysis for the Addictive Tendencies Scale

A one-factor CFA was also conducted on the ATS. Results presented in Table 6 showed a poor fit of the default model. A review of modification index suggested the presence of residual covariance among item-6, item-7, and item-8. Addition of the three residual covariances

resulted in a significant improvement ($\Delta\chi^2 = 48.46$, df = 3, $p < .01$) and an excellent fit of the model (M1) to the data (χ^2(df) = 31.24 (17) $p = .02$, CFI = .96, TLI = .92, IFI = .96, and RMSEA = .05, $p = .41$). Item loading ranging from ($\lambda = .30$ to $\lambda = .63$) presented in Table 5 showed that all items are the valid indicator of the latent measure of the ATS. Gender invariance testing with a good fit of the model at configural level invariance and non-significant delta chi-square at metric level ($\Delta\chi^2 = 5.90$, df = 8, $p < .66$), and scalar level ($\Delta\chi^2 = 17.51$, df = 15, $p < .29$) further supported the stability and generalization of one factor model for male and female participants.

Discussion

The present study sought to provide further evidence of the psychometric properties of the three existing measures of "Facebook engagement and/or addiction", the BFAS, the FIS, and the ATS, among a convenience non-clinical sample of English speaking Pakistani university students. Specifically, the present aims were to examine the dimensionality and construct validity of the three measures. From the results of this study, five points are worthy of discussion.

First, all respondents had a Facebook account, attesting to the fact that Facebook is a popular vehicle for the respondents to enable social interaction. Moreover, for some respondents their Facebook account was used for a considerable amount of time each day, thereby indicating evidence of possible addiction.

Second, satisfactory levels of internal consistency were found for each of the three scales at both Time 1 and Time 2 (>.7; Kline, 2015). These findings are in line with those obtained by previous researchers in a range of different samples. For example, the BFAS (Cronbach's alpha = .83; Andreassen et al., 2012), the FIS (Cronbach's alpha = .83; Ellison et al., 2007), and the ATS (Cronbach's alpha = .85; Pelling & White, 2009).

Third, satisfactory levels of temporal stability were found for each of the three scales over the four weeks. These findings are in line with those obtained by previous researchers, for example, with the BFAS (.82 for test-retest over three weeks; Andreassen et al., 2012). However, as no previous research was found on the temporal stability of the FIS (Ellison et al., 2007), or the ATS (Pelling & White, 2009), the present findings provide some consensus in the consistency over time of such measures of “Facebook engagement and/or addiction”.

Fourth, it was found that at both Time 1 and Time 2, all three scales were significantly inter-correlated with each other. It can be argued therefore that this provides support for the construct validity for each of the scales, as each was developed to measure different aspects of “Facebook engagement and/or addiction”, and therefore should be positively associated, indicating these measures are tapping the same underlying construct of “Facebook engagement and/or addiction”, but not strongly associated as they are measuring different facets. That is, with the BFAS measuring the possibility of an obsession with Facebook, the FIS measuring how emotionally connected individuals were to Facebook and the ATS measuring the levels of usage of social networking sites in general (e.g., Facebook, Bebo) along with any addictive tendencies towards their use. It is interesting to note that the two measures that were the most strongly associated were the BFAS and the ATS, whilst results for the FIS indicated weaker relationships. Furthermore, in terms of the association between the activity measures of Facebook “friends” and average daily “time spent” on Facebook, at both Time 1 and Time 2, both measures were significantly associated with each other, whilst also being significantly associated with both the BFAS and the FIS. However, at both Time 1 and Time 2, the average daily time spent on Facebook was significantly associated with the ATS, while the number of Facebook “friends” was not.

Fifth, a one-factor structure was found to be a good description of the data for each of the three measures. For the BFAS, Andreassen et al. (2012) did not report a factor analysis to

346 investigate if their 18-item pool constituted six factors, which in turn constituted a single factor.
347 Rather, they used item-total correlations to create the six-item scale. The present results
348 extended psychometric support for BFAS by providing evidence regarding the validity of all
349 the six items to measure a single factor representing “Facebook Addiction”. The study further
350 extended what is known about the psychometric properties of the three scales by testing gender
351 invariance of the factor structure at configural, metric, and scalar level. Adding evidence to
352 external validity, the results supported the generalizability of the factor structure even at the
353 scalar level, showed that the measures are invariant at a stronger level, and suggested that
354 measures are equally useful for both male and female participants.

355 There were several limitations to the methodology employed in the present study. The
356 sample employed was a small (N = 308) convenience sample of Pakistani students and was
357 therefore not representative of the wider Pakistani population. The interval period between the
358 administration and re-administration of the measure was relatively brief i.e., four weeks (cf.
359 Andreassen et al., 2012), and falls somewhat short of the three-month period typically
360 employed (Kline, 2015). Although this study utilised a sample of Pakistani students, the effect
361 of culture was not considered. Furthermore, clinical implications and response bias were also
362 not considered.

363 However, notwithstanding these points, for the three scales of “Facebook engagement
364 and/or addiction”, the data demonstrated satisfactory psychometric properties, including
365 internal consistency, temporal stability, and construct validity. Moreover, for these measures,
366 a one-factor structure was found to be a good description of the data. These findings build on
367 the satisfactory psychometric properties previously reported in Western and North American
368 samples (Ellison et al., 2007; Steinfield, Ellison, & Lampe, 2008; Valenzuela, Park, & Kee
369 2009), as well as samples recruited from the internet (Burke, Marlow, & Lento, 2010), and

370 further support the use of these three measures in research settings to examine the
371 psychological consequences of social media.

372 No attempt was made to review cultural or clinical factors within this study. Future
373 work may wish to translate the three measures of facebook addiction into the official language
374 of Pakistan, that of Urdu, or indeed any of the regional languages.

375

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Table 1. Means, Standard Deviations, and Reliabilities of The Bergen Facebook Addiction Scale, The Facebook Intensity Scale, and The Addictive Tendencies Scale at both Time 1 and Time 2 Testing Periods (N = 142).

Measures	Time 1		Time 2				
	Alpha	Mean (SD)	Alpha	Mean (SD)	*r*	ICC	*t*
Bergen Facebook Addiction Scale	.79	17.27 (5.30)	.68	17.03 (4.37)	.82**	.232	-6.566***
Facebook Intensity Scale	.79	18.24 (4.72)	.86	18.73 (4.90)	.98**	.065	.466
Addictive Tendencies Scale	.74	33.98 (8.82)	.76	32.40 (7.19)	.80 **	.268	.016

** *p<0.01*; ****p<0.001*

r = Pearson's Product-Moment Correlation Coefficient

ICC = Intraclass Correlation Coefficient

t = Paired Samples T-Test

Table 2. Correlations between The Bergen Facebook Addiction Scale, The Facebook Intensity Scale, and The Addictive Tendencies Scale (N = 142).

	FB Friends[1]	Time on FB[1]	BFAS[1]	FIS[1]	ATS[1]	FB Friends[2]	Time on FB[2]	BFAS[2]	FIS[2]	ATS[2]
FB Friends[1]	-									
Time on FB[1]	.11	-								
BFAS[1]	.15**	.26**	-							
FIS[1]	.09	.23**	.42**	-						
ATS[1]	.13*	.17**	.42**	.35**	-					
FB Friends[2]	.98**	.42**	.23**	.97**	.17*	-				
Time on FB[2]	.25**	.69**	.19*	.41**	.25**	.28**	-			
BFAS[2]	.20*	.24**	.82**	.25**	.19*	.20*	.29**	-		
FIS[2]	.96**	.52**	.26**	.98**	.21*	.98**	.45**	.24**	-	
ATS[2]	.11	.22**	.28*	.17*	.80**	.13	.24**	.26**	.17	-

*$p < 0.05$; **$p<0.01$.

Key:

BFAS[1] = Bergen Facebook Addiction Scale at Time 1

BFAS[2] = Bergen Facebook Addiction Scale at Time 2

FIS[1] = Facebook Intensity Scale at Time 1

FIS[2] = Facebook Intensity Scale at Time 2

ATS[1] = Addictive Tendencies Scale at Time 1

ATS[2] = Addictive Tendencies Scale at Time 2

FB Friends[1] = Total number of Facebook Friends at Time 1

FB Friends[2] = Total number of Facebook Friends at Time 2

Time on FB^1 = Average time spent on Facebook per day at Time 1

Time on FB^2 = Average time spent on Facebook per day at Time 2

Table 3. Factor Loadings, employing CFA, for The Bergen Facebook Addiction Scale (N = 308).

Item No.	Statements	Factor Loadings (λ)		
		Whole	Male	Female
1	Spent a lot of time thinking about Facebook.	.50	.66	.42
5	Felt an urge to use Facebook more and more.	.64	.65	.65
7	Used Facebook to forget about personal problem.	.63	.63	.66
11	Cut down on the use of Facebook without success.	.73	.74	.76
13	Restless if prohibited from using Facebook.	.61	.61	.64
16	Negative impact on your job/studies.	.64	.66	.64

Table 4. Factor Loadings, employing CFA, for The Facebook Intensity Scale (N = 308).

Item No.	Statements	Factor Loadings (λ)		
		Whole	Male	Female
1	Facebook is part of my everyday activity.	.72	.74	.70
2	I am proud to tell people I’m on Facebook.	.46	.48	.43
3	Facebook has become part of my daily routine.	.82	.82	.81
4	Out of touch when haven’t logged onto Facebook.	.54	.58	.52
5	I feel I am part of the Facebook community.	.56	.56	.55
6	I would be sorry if Facebook shut down.	.45	.47	.41

Table 5. Factor Loadings, employing CFA, for The Addictive Tendencies Scale (N = 308)

Item No.	Statements	Factor Loadings (λ)		
		Whole	Male	Female
1	I often think about social network sites.	.63	.63	.63
2	I often use social networking sites.	.62	.62	.63
3	Arguments have arisen with others.	.63	.62	.64
4	I interrupt whatever else I am doing to check.	.51	.51	.55
5	I feel connected to others.	.48	.49	.47
6	I lose track of how much I am using sites.	.30	.29	.29
7	Unable to use social networking websites/distressed	.30	.29	.28
8	Unable to reduce my social networking website.	.39	.41	.39

Table 6. Model fit indices of CFAs, for The Bergen Facebook Addiction Scale, The Facebook Intensity Scale, and The Addictive Tendencies Scale (N = 308)

Scale	Models	$\chi^2(df)$	*p*	CFI	TLI	IFI	RMSEA	*p*-close	$\Delta\chi^2$		ΔCFI	ΔRMSEA
									$\Delta\chi^2(df)$	*p*		
BFAS	Default	13.65(9)	.14	.99	.98	.99	.04	.59	-	-	-	-
	Configural	22.41(18)	.21	.99	.98	.99	.03	.84	-	-	-	-
	Metric	27.51(24)	.28	.99	.98	.99	.03	.89	5.10(6)	.53	-.002	.006
	Scalar	30.73(30)	.43	1.00	1.00	1.00	.01	.98	8.31(12)	.78	-.008	.019
FBIS	Default	77.88(9)	.00	.86	.68	.86	.16	.00	-	-	-	-
	M1	17.56(6)	.01	.98	.92	.98	.08	.11	-	-	-	-
	Configural	35.63(12)	.00	.95	.84	.96	.08	.05	-	-	-	-
	Metric	40.40(18)	.00	.96	.90	.96	.06	.18	4.77(6)	.57	-.003	.016
	Scalar	43.24(24)	.01	.96	.93	.96	.05	.43	7.61(12)	.83	-.009	.029
ATS	Default	79.70(20)	.00	.84	.72	.85	.10	.00	-	-	-	-
	M1	31.24(17)	.02	.96	.92	.96	.05	.41	-	-	-	-

Configural	50.90(34)	.03	.96	.91	.96	.04	.74	-	-	-	-
Metric	56.80(42)	.06	.96	.93	.96	.03	.89	5.90(8)	.66	-.006	.006
Scalar	68.41(49)	.04	.95	.92	.95	.04	.88	17.51(15)	.29	.007	.004

BFAS: Bergen Facebook Addiction Scale, ATS: Addictive Tendencies Scale, FIS: Facebook Intensity Scale

Default: CFA for proposed structure of the scale

M1: Addition of residual covariances in default model